CHAPTER 9

LIST OF EFFECTIVE TEMPORARY REVISIONS

FOLLOWING IS A COMPLETE LISTING OF ALL ACTIVE TEMPORARY REVISIONS (TR'S). TR'S NOT LISTED SHOULD BE REMOVED. THE ATA NUMBER, CONFIG CODE AND PAGE NUMBER IDENTIFIES THE PAGE PRECEDING THE TR.

TR NUMBER	ATA NUMBER	CONFIG CODE	PAGE NUMBER	TR DATE

NONE

CHAPTER 9

TOWING AND TAXIING

LIST OF EFFECTIVE PAGES

	CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE	CHAPTER/ SECTION	PAGE	DATE	CONFIG CODE
	List of Effective Pages	1/2	Dec 15/95					
	Table of Contents	1/2	Dec 15/94					
	9-00-00	1	Sep 15/73					
	9-00-00	2	May 15/76					
	9-00-00	3/4	Jul 15/84					
	9-10-00	1	May 15/86					
	9-10-00	2	May 15/86					
	9-11-00	201	May 15/90					
	9-11-00	202	Mar 15/83					
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R	9-11-00	210	Dec 15/95					
R	9-11-00	211/212	Dec 15/95					
	9-12-00	201	May 15/86					
	9-12-00	202	May 15/75					
	9-12-00	203	Dec 1/71					
	9-12-00	204	Dec 1/71					
	9-12-00	205	May 15/86					
	9-12-00	206	Jul 15/83					
	9-12-00	207	Jul 15/83					
	9-12-00	208	Jul 15/83					
	9-12-00	209/210	Jul 15/83					
	9-20-00	1/2	Dec 1/71					
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	9-21-00	202	Nov 15/81					
	9-21-00	203	Feb 15/79					
	9-21-00	204	Jul 15/84					
	9-21-00	205/206	Feb 15/79					

CHAPTER 9

TOWING AND TAXIING

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TOWING AND TAXIING - DESCRIPTION AND OPERATION

1. General

This chapter presents the methods and capabilities for, and limitations imposed, during towing and taxiing operations.

The nose landing gear shock strut is used for normal towing or pushing of the aircraft on hard surfaces.

The main landing gear is used for abnormal towing conditions, such as when the aircraft is off the runway in mud, snow, soft sand, or damaged.

Normal taxiing is performed by using the Captains nosewheel steering and rudder pedals. The aircraft can also be steered by using asymmetrical engine thrust.

Towing and taxiing restrictions imposed due to flat tire conditions are given in Figure 1.

This information is intended as a guide for towing or taxiing the airplane with flat tires under most conditions.

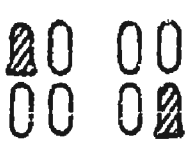
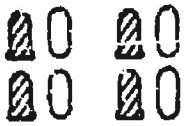
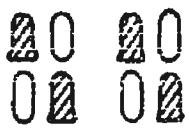
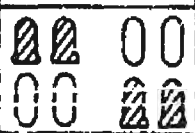
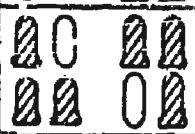
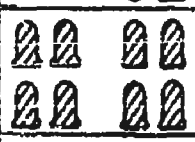
CAUTION: UNDER FLAT TIRE CONDITIONS, REDUCE SPEED TO MINIMUM IN ALL CASES. AVOID SHARP TURNS, AND SUDDEN STOPS OR STARTS.

AFTER ANY TIRE FAILURE, AFFECTED WHEEL ASSEMBLY MUST BE INSPECTED.

AIRPLANE SHOULD BE MOVED THE MINIMUM DISTANCE POSSIBLE WHEN MORE THAN ONE FLAT TIRE PER AXLE OR MORE THAN A TOTAL OF FIVE FLAT TIRES EXIST.

Area requirements for movement of the airplane are given in Figure 2.

ALLOWABLE TOWING OR TAXIING UNDER FLAT TIRE CONDITIONS (SMOOTH RUNWAY)

MAIN GEAR	TIRE CONFIGURATION LEFT TRUCK	TIRE CONFIGURATION RIGHT TRUCK	ALLOWABLE DISTANCE	NOSE WHEEL ANGLE OF TURN	CONDITIONAL REQUIREMENTS
ONE FLAT TIRE (ANY TIRE)			MINIMUM TO CLEAR ACTIVE RUNWAY AND TAXIWAY	NORMAL	ABRUPT STARTS OR STOPS, SHARP TURNS, OR ROUGH OR SOFT RUNWAYS COULD ALLOW WHEEL FLANGES TO CONTACT GROUND, RESULTING IN DAMAGE TO WHEEL OR GEAR COMPONENTS.
ONE FLAT TIRE PER AXLE (IN TANDEM)			MINIMUM TO CLEAR ACTIVE RUNWAY AND TAXIWAY	NORMAL	ABRUPT STARTS OR STOPS, SHARP TURNS, OR ROUGH OR SOFT RUNWAYS COULD ALLOW WHEEL FLANGES TO CONTACT GROUND, RESULTING IN DAMAGE TO WHEEL OR GEAR COMPONENTS.
ONE FLAT TIRE PER AXLE (STAGGERED)			MINIMUM TO CLEAR ACTIVE RUNWAY AND TAXIWAY	NORMAL	ABRUPT STARTS OR STOPS, SHARP TURNS, OR ROUGH OR SOFT RUNWAYS COULD ALLOW WHEEL FLANGES TO CONTACT GROUND, RESULTING IN DAMAGE TO WHEEL OR GEAR COMPONENTS.
TWO FLAT TIRES ON THE AXLE			ABSOLUTE MINIMUM	NO SHARP TURNS	STOP AIRPLANE. REPLACE FLAT TIRES WITH SERVICEABLE ASSEMBLIES TO OBTAIN A MINIMUM OF ONE SERVICEABLE ASSEMBLY PER AXLE.
THREE FLAT TIRES			ABSOLUTE MINIMUM	NO SHARP TURNS	STOP AIRPLANE. REPLACE FLAT TIRES WITH SERVICEABLE ASSEMBLIES TO OBTAIN A MINIMUM OF ONE SERVICEABLE ASSEMBLY PER AXLE.
FOUR FLAT TIRES			ABSOLUTE MINIMUM	NO SHARP TURNS	STOP AIRPLANE. REPLACE FLAT TIRES WITH SERVICEABLE ASSEMBLIES TO OBTAIN A MINIMUM OF ONE SERVICEABLE ASSEMBLY PER AXLE.
NOSE GEAR					
ONE FLAT TIRE			TO TERMINAL OR HANGER	NO SHARP TURNS	ABRUPT STARTS OR STOPS, SHARP TURNS, OR ROUGH OR SOFT RUNWAYS COULD ALLOW WHEEL FLANGES TO CONTACT GROUND, RESULTING IN DAMAGE TO WHEEL OR GEAR COMPONENTS.
TWO FLAT TIRES			ABSOLUTE MINIMUM	NO SHARP TURNS	STOP AIRPLANE. REPLACE FLAT TIRES WITH SERVICEABLE ASSEMBLIES TO OBTAIN A MINIMUM OF ONE SERVICEABLE ASSEMBLY PER AXLE.

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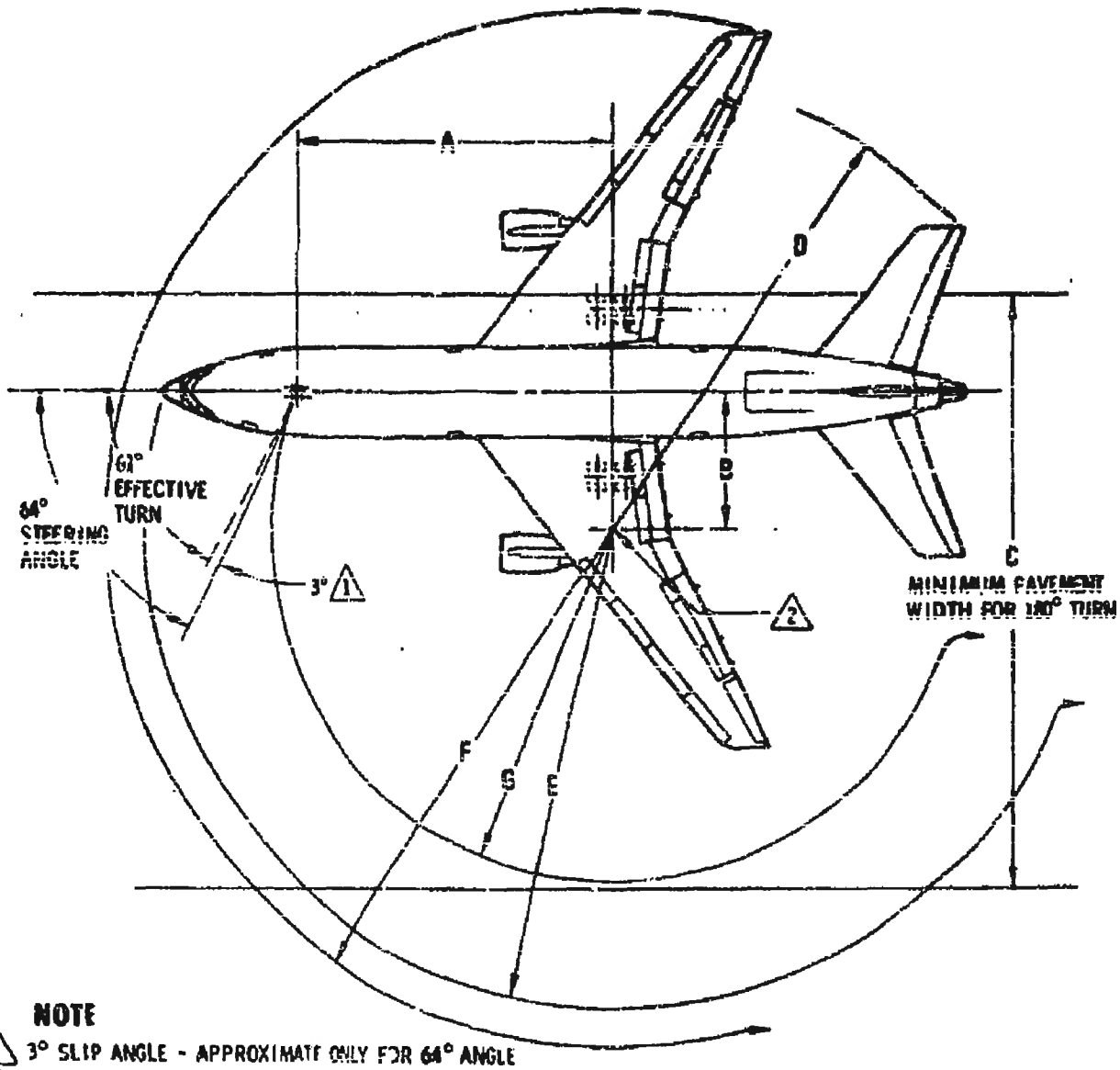
Towing or Taxiing with Flat Tire
Figure 1

EFFECTIVITY: ALL

0118



NOTE

1. 3° SLIP ANGLE - APPROXIMATE ONLY FOR 64° ANGLE
2. THEORETICAL CENTER OF TURN FOR MINIMUM TURNING RADIUS. TURN INITIATED WITH AIRPLANE IN MOTION. APPROXIMATELY IDLE THRUST ON ALL ENGINES. NO DIFFERENTIAL BRAKING

FT-IN / M	A	B	C	D	E	F	G
L-1011-1 L-1011-100 L-1011-200	70-0 / 21.34	38-10 / 11.84	141-3 / 43.05	106-9 / 32.46	107-0 / 32.61	121-3 / 36.96	80-2 / 24.76

MI-0003-09-002

R Minimum Turning Radii
R Figure 2

EFFECTIVITY: ALL

0018

TOWING - DESCRIPTION AND OPERATION

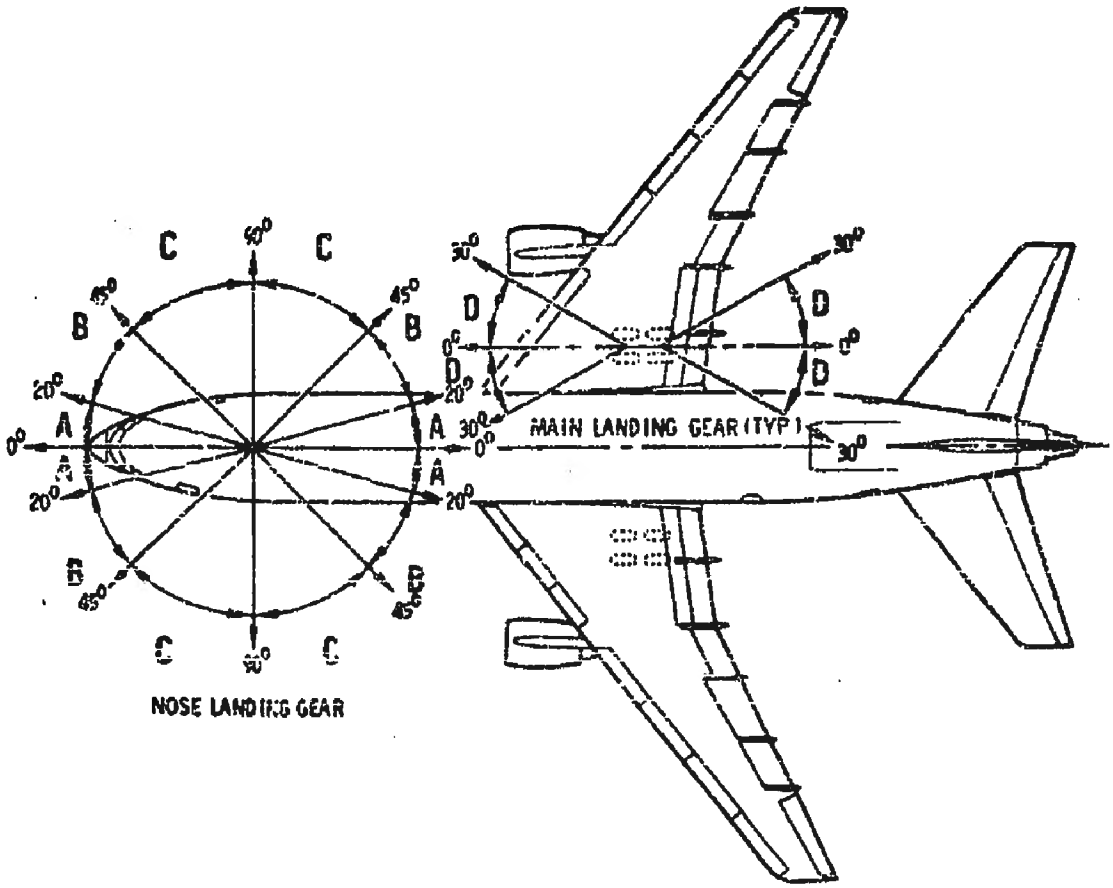
1. General

The aircraft is moved for normal maintenance, ramp functions, or with various engines removed by towing at the nose gear lugs. Normal towing or pushing operations may be performed within the mechanical limits of the nosewheel steering system without disconnecting the nose gear torque links. When turning the aircraft beyond the mechanical limits of the nosewheel steering system (65 (±2) degrees either side of center), the apex pin must be removed from the nose landing gear torque arms to allow 360-degree rotation of the gear.

R On Aircraft at Maximum Taxi Gross Weight (MTGW) less than
R 498,000 pounds,
R the maximum towing load that may be applied to the aircraft nose
R landing gear at either the forward or rear tow lugs is 70,200
R pounds. This load may be applied in either the forward or aft
R direction at any angle up to 20 degrees left or 20 degrees right
R from the aircraft centerline. At towing angles between 20
R degrees to 45 degrees the maximum towing load is 35,100 pounds,
R and at 90 degree towing angle the maximum towing load is 24,816
R pounds. Further definition of nose gear towing is covered in
R Figure 1. The maximum towing load that may be applied to the
R main gear is 52,650 pounds which may be applied at any angle up
R to 30 degrees left or 30 degrees right in a forward direction on
R a forward tow lug, or in a rearward direction on the aft tow
R lug.

R The above maximum permitted tow loads are the design limit load
R values and may be safely applied for both normal or abnormal
R towing conditions.

R All towing should be done using approved tow bars on the nose
R gear, and approved tow cable assemblies on the main gears to
R avoid damage to tow lugs or other landing gear structure.
R Approved tow bars and tow cables have load limiting fuses which
R prevent structural damage to landing gear structure.



MAXIMUM PERMITTED TOWING LOADS (NORMAL AND ABNORMAL TOWING)	TOWING DEVICE	MAXIMUM TOW LOAD PERMITTED BY LOAD LIMITING FUSE
A 70,200 LB (31,842 KG) (RANGE OF 0° TO 20° FROM ℄)	TOWBAR	55,485 ±2,500 LBS.
B 35,100 LB (15,921 KG) (RANGE OF 20° TO 45° FROM ℄)	↓	↓ ↓
C 35,100 LB (15,921 KG) AT 45° FROM ℄ VARYING TO 24,816 LB (11,256 KG) AT 90° FROM ℄ (LINEAR VARIATION AS SHOWN)	↓	↓ ↓
D 52,650 LB (23,882 KG) (RANGE OF 0° TO 30° FROM ℄)	TOW CABLE	35,000 LBS. FOR B751-101 CABLE 41,500 LBS. FOR B751-103 CABLE

NOTE

1. MAXIMUM PERMITTED TOWING LOADS SHOWN ARE DESIGN LIMIT VALUES.
2. NLG TOWBAR LOADINGS IN ALL FOUR QUADRANTS ARE SYMMETRICAL AND CAN BE EITHER PUSH OR PULL. PULL LOADINGS ARE RECOMMENDED WHERE HIGHER RANGE OF LOAD IS REQUIRED FOR ABNORMAL TOWING.
3. MLG TOWING LOADS SHOULD BE APPLIED BY TOW CABLE.
4. FOR ABNORMAL TOWING AT LOADS IN EXCESS OF FUSE VALUES SPECIAL TOW CABLES SHOULD BE RIGGED.

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R

Ground Towing Load Limitations
Figure 1

EFFECTIVITY: MAXIMUM TAXI GROSS WEIGHT LESS THAN 498,000 POUNDS

001B

NORMAL TOWING CONDITIONS - MAINTENANCE PRACTICES

1. Equipment and Materials

Landing Gear Downlock Safety Pins Dwg No. 1302300, or Towing Lockout Pin, Dwg No. 1302788, or equivalent

Towbar, PN TB-571, Wollard Aircraft Equipment Co., or equivalent

Tractor (heavy) Model T800S, International Harvester, or equivalent

Tractor (medium) Model T500S, International Harvester, or equivalent

MLG Towing Cable Assembly, PN B751-101 and PN B751-103, or equivalent

Wheel Chocks (MLG), Brooks & Perkins Inc., or equivalent

2. Referenced Procedure

10-10-00 Parking - Maintenance Practices

3. Maintenance Practices

A. Preparation

C (1) Check that main gear and cargo doors are closed.

R R (2) Check nose gear strut for inflation (Ref. Fig. 201). Strut extension must be 2-inches (5.1 cm) minimum and 10 inches (25.4 cm) maximum of NLG piston chrome plating showing.

(3) Install Towing Lockout (nose gear steering lockout) pin in nose gear steering valve (Ref. Fig. 202).

(4) Connect towbar to tractor and engage safety latch.

CAUTION: BEFORE APPLYING ELECTRICAL POWER VERIFY GEAR-NOSE STEERING CIRCUIT BREAKER (F19) ON FLIGHT ENGINEER/SECOND OFFICERS OVERHEAD CIRCUIT BREAKER PANEL, CB2, IS OPEN. VERIFY LANDING GEAR CONTROL LEVER IS IN DOWN POSITION.

R WARNING: THE TOWBAR IS PROVIDED WITH TWO SHEAR PINS WHICH
R ARE DESIGNED TO SHEAR UNDER A LOAD IN EXCESS OF
R 55,000 LB (24,943 KG). IF SHEAR PINS SHOULD FAIL
R WHILE AIRCRAFT IS BEING TOWED, TRACTOR OPERATOR
R MUST NOT BRAKE TRACTOR UNTIL AIRCRAFT HAS BEEN
R STOPPED. IF SHEAR PINS SHOULD FAIL WHEN AIRCRAFT
R IS BEING PUSHED, TRACTOR OPERATOR MUST ALLOW
R AIRCRAFT TO STOP TRACTOR. AIRCRAFT BRAKES MUST BE
R APPLIED TO STOP AIRCRAFT.

R (5) Connect towbar to nose gear shock strut forward of aft towing lug and rotate towbar latching mechanism until securely latched. Connect ground power cable and interphone cable from tow tractor (Ref. Fig. 203).

R CAUTION: TO PREVENT STRUCTURAL DAMAGE TO AIRCRAFT, ENSURE
R MAXIMUM TOWING LOADS TO NOSE GEAR TOWING LUGS ARE NOT EXCEEDED (REF. FIG. 206). TOWBAR SHEAR PIN VALUES ARE GREATER THAN ALLOWABLE NOSE GEAR LOADS
R IN TURNS IN EXCESS OF 20-DEGREES. TO PREVENT
R STRUCTURAL DAMAGE TO TORQUE ARMS, ENSURE TORQUE ARM IS SECURED IN DETENT AFTER PIN IS REMOVED.

R (6) Remove torque arm apex pin from torque arms if turns beyond mechanical limits of nose gear steering system are expected; stow upper torque arm in detent. On aircraft 001-014 only, disconnect on-board weight and balance system electrical connector and stow in detent (Ref. Fig. 204).

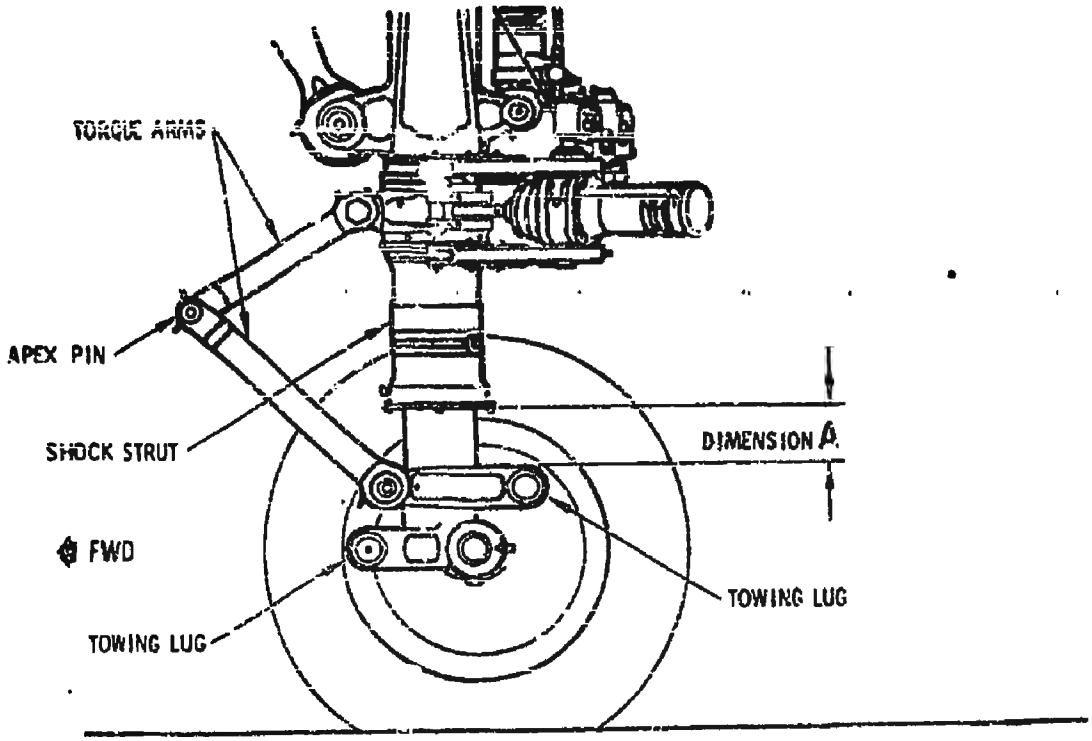
C (7) Station one qualified man in Flight Station, zone 210,
C in Captains seat to operate brakes in case of an
C emergency and to act as an observer.

R (8) With the EXT PWR toggle switch on Flight
R Engineer/Second Officers electrical control panel, zone
R 215, in ON position, check for 115-119V and 396-404-Hz
R on voltage and frequency meters on same panel.

(9) Establish communication between tractor driver and men in flight station through pilot/mechanic call system.

R (10) On Flight Engineer/Second Officers HYDRAULIC SYSTEM
R panel, zone 215, depress (latched in) AC PUMP B3
R switchlight (ON legend illuminated). Hydraulic B
R system pressure must be 3000 psi, and B system FLUID
R QUANTITY meter must indicate in green zone.

R CAUTION: HYDRAULIC SYSTEM C AC PUMP IS NOT REQUIRED FOR TOWING, BUT IF USED, IT IS IMPERATIVE THAT TOWING LOCKOUT (NOSE GEAR STEERING LOCKOUT) PIN BE INSTALLED.



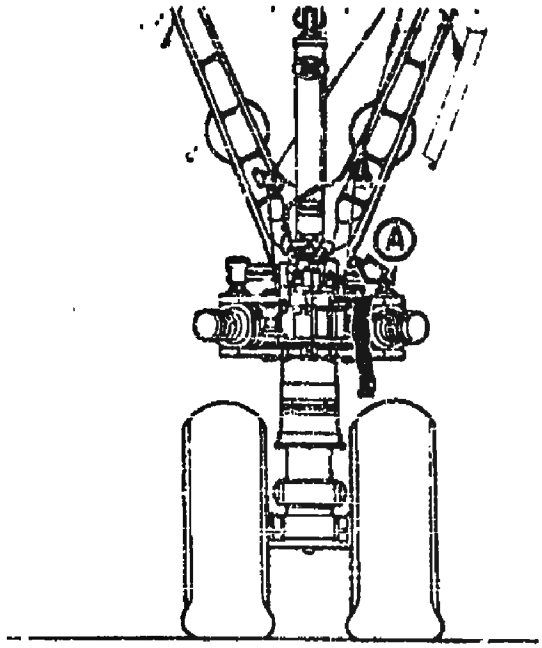
NOSE LANDING GEAR

STRUT POSITION	DIMENSION A	
	INCHES	CENTIMETERS
STRUT STATIC POSITION	4.50	11.43
STRUT MINIMUM EXTENSION	2.0	5.08
STRUT MAXIMUM EXTENSION	10.0	25.4

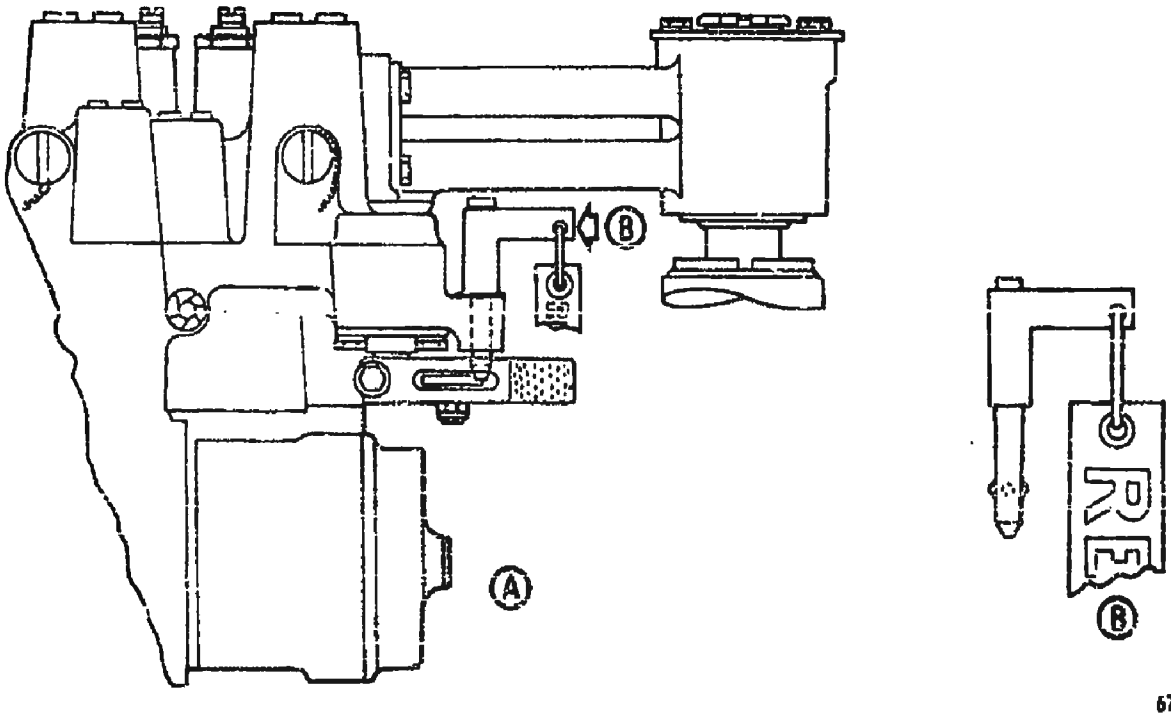
R Nose Gear Shock Strut Inflation for Towing and Taxiing
R Figure 201

EFFECTIVITY: ALL

0018



VIEW LOOKING FWD



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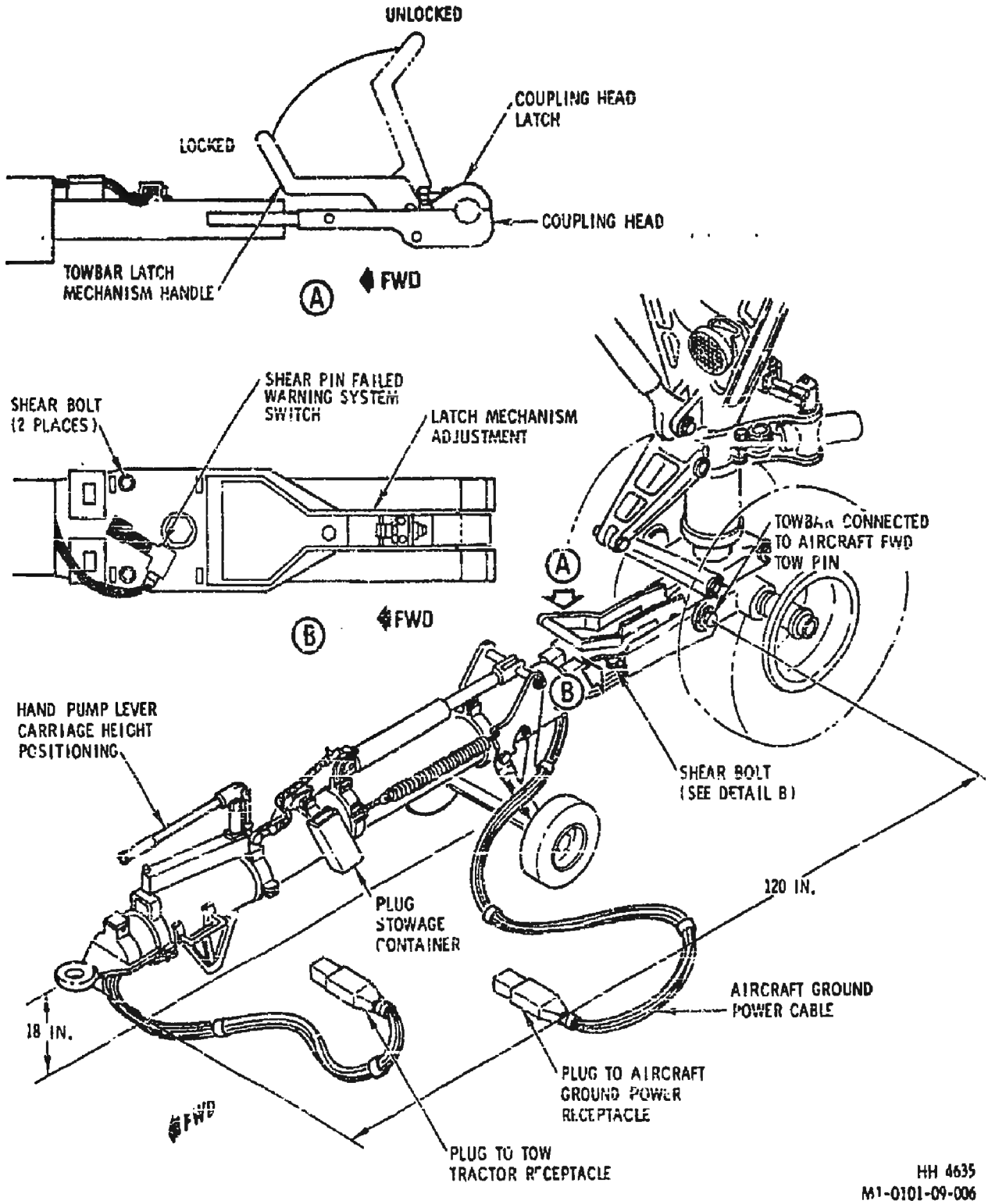
MI-A00-00-0079

R Towing Lockout (Nose Gear Steering Lockout) Pin
R Figure 202



HH 4635
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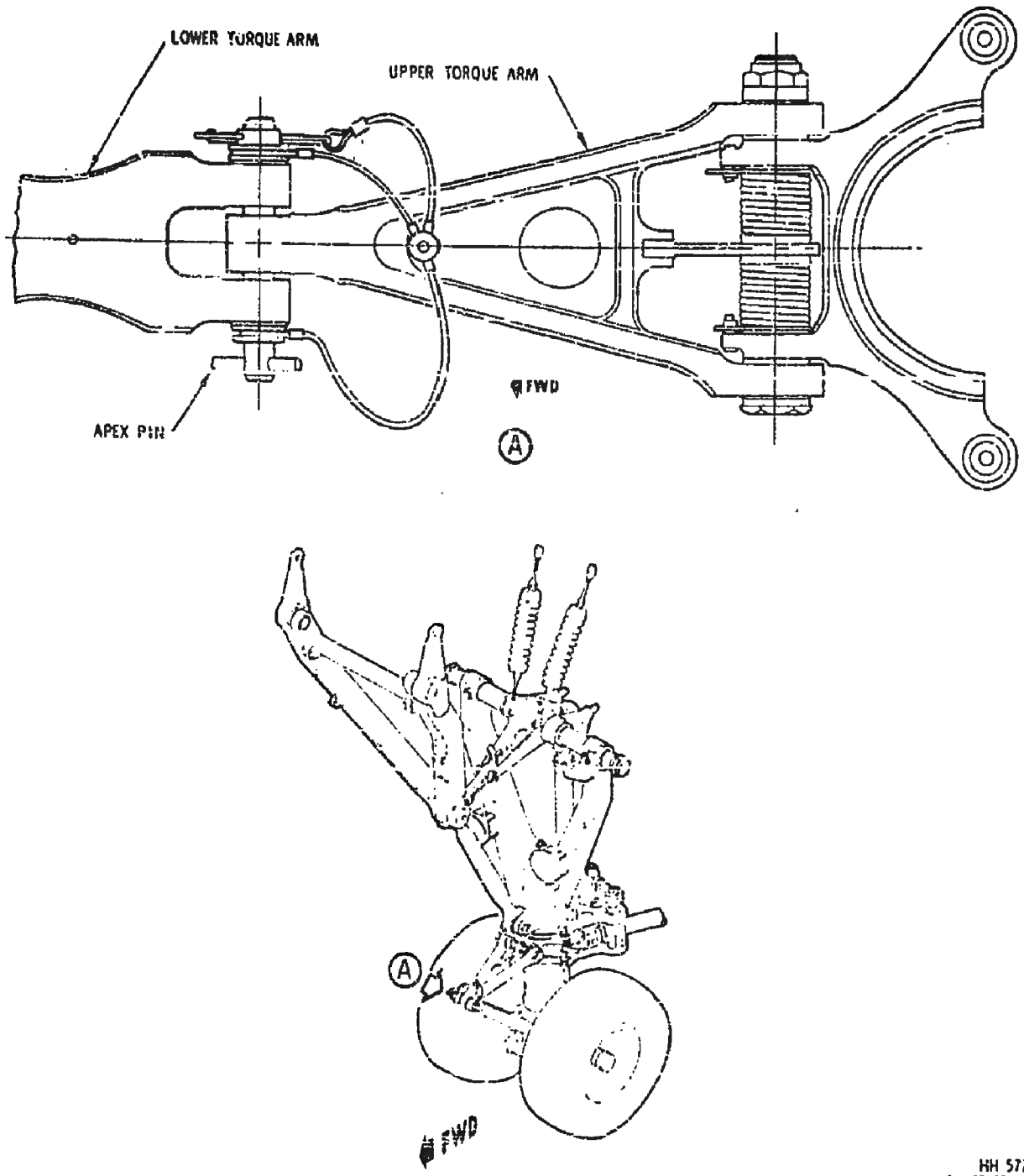
Towbar and Towbar Attachment
Figure 203



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M1-A00-09-005

Torque Arm Apex Pin
Figure 204

(11) If towing at night, turn on wing POSITION and WHEEL WELL lights on eyebrow panel, zone 210.

R (12) Position BRAKE SYS SELECT switch on pilots center
R instrument panel, zone 210, in NORM SYS B position and
R ANTI-SKID monitor ON-OFF switch on pilots overhead
R panel, zone 210, in OFF position.

CAUTION: TO PREVENT DAMAGE TO AIRCRAFT, WING WALKERS MUST BE STATIONED AT WINGTIPS WHEN TOWING AIRCRAFT IN CONGESTED AREAS.

(13) Remove all wheel chocks, static ground cables, mooring and tiedown cables, and all ground servicing equipment from area.

B. Towing

(1) Tow or push aircraft making smooth starts and stops (Ref. Fig. 205).

(2) When towing an aircraft, yield right-of-way and priority of movement to taxiing aircraft.

R (3) Upon completion of towing, the last 15-feet (4.6 m) of travel should be in a straight line to eliminate scrubbing and side load on tires.

C C. Towing with B hydraulic pump OFF.

C Towing with the B pump off may be done with the following
C additional precautions.

C (1) Recognize that only four (4) full brake applications
C are available from the accumulator.

C (2) Pressurize B system brake accumulator to 3000 PSI
C before turning pump off.

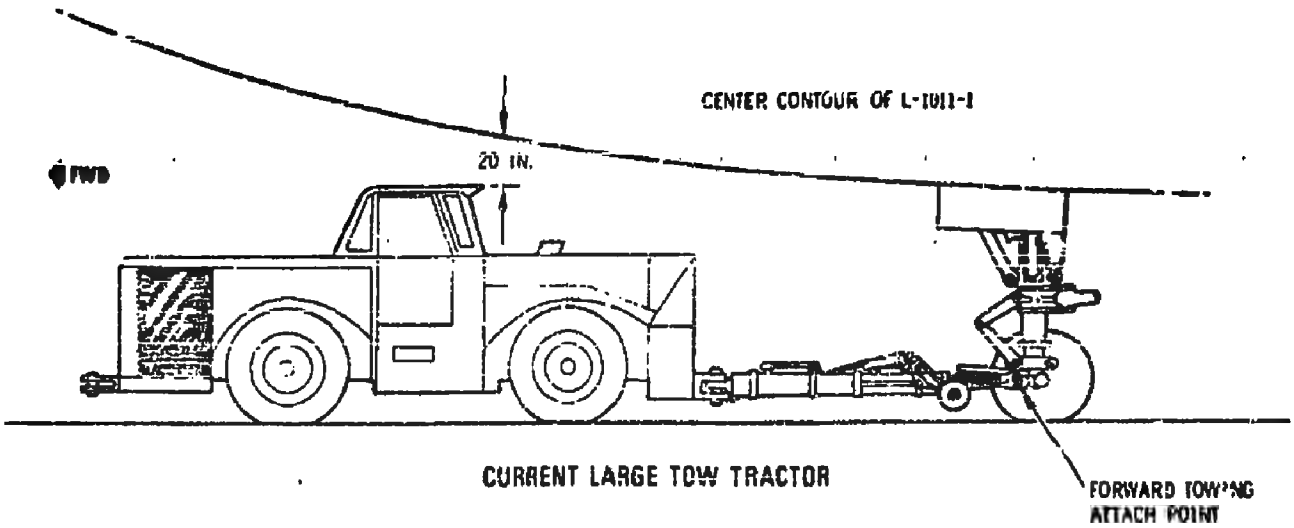
C (3) Continued braking will not be required.

C (4) B system A/C pump must be started immediately if
C required for braking.

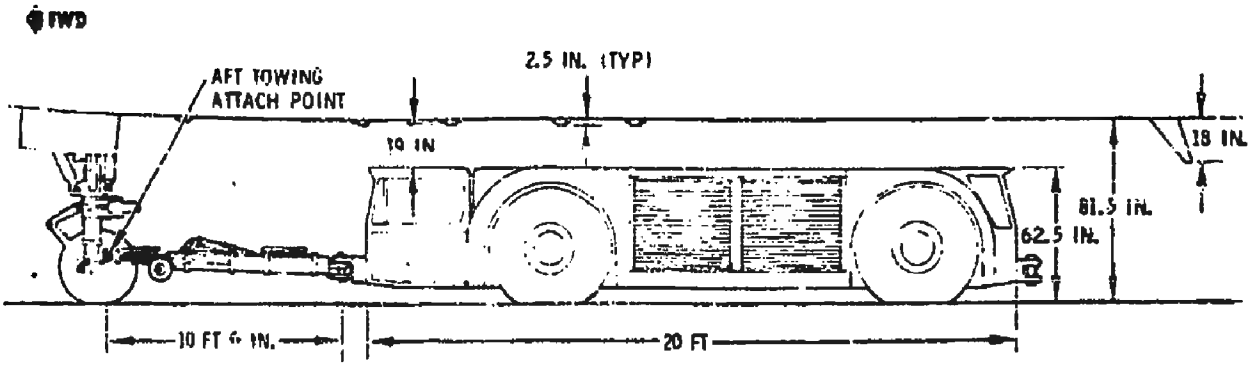
C (5) Double check that anti-skid is OFF.

C D. Alternate Towing Procedure

C (1) Alternate towing procedure may be used when no external
C power is available during the towing operation. The
C following steps must be followed in order to assure
C that there will be brake pressure if needed.



CURRENT LARGE TOW TRACTOR



NEW DESIGN LOW PROFILE TOW TRACTOR

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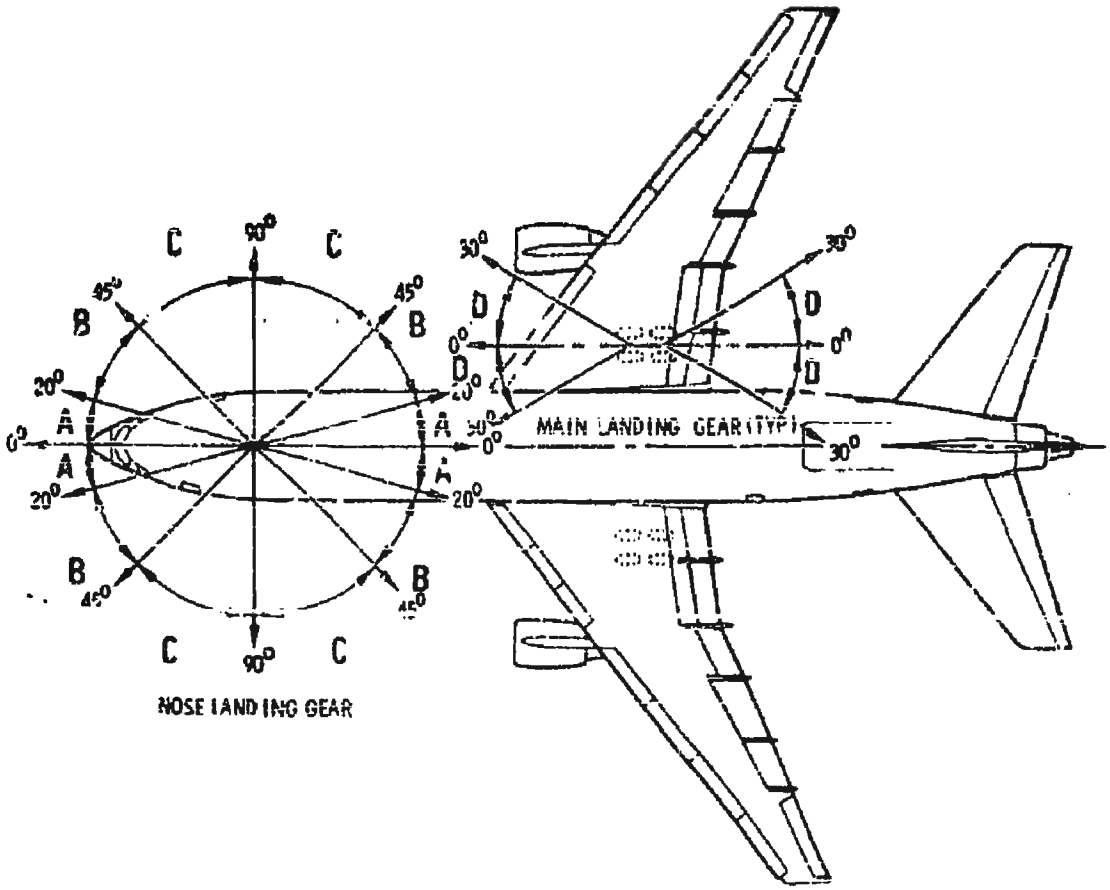
Nose Gear Towing
Figure 205



	MAXIMUM PERMITTED TOWING LOADS (NORMAL AND ABNORMAL TOWING)	TOWING DEVICE	MAXIMUM TOW LOAD PERMITTED BY LOAD LIMITING FUSE
A	70,200 LB (31,842 KG) (RANGE OF 0° TO 20° FROM ℄)	TOWBAR	55,485 ± 2,500 LBS.
B	35,100 LB (15,921 KG) (RANGE OF 20° TO 45° FROM ℄)	↓	↓ ↓
C	35,100 LB (15,921 KG) (AT 45° FROM ℄ VARYING TO 24,816 LB (11,256 KG) AT 90° FROM ℄ (LINEAR VARIATION AS SHOWN)	↓	↓ ↓
D	52,650 LB (23,882 KG) (RANGE OF 0° TO 30° FROM ℄)	TOW CABLE	35,000 LBS. FOR B751-101 CABLE 44,500 LBS. FOR B751-103 CABLE

NOTE

1. MAXIMUM PERMITTED TOWING LOADS SHOWN ARE DESIGN LIMIT VALUES
2. NLG TOWBAR LOADINGS IN ALL FOUR QUADRANTS ARE SYMMETRICAL AND CAN BE EITHER PUSH OR PULL. PULL LOADINGS ARE RECOMMENDED WHERE HIGHER RANGE OF LOAD IS REQUIRED FOR ABNORMAL TOWING.
3. MLG TOWING LOADS SHOULD BE APPLIED BY TOW CABLE.
4. FOR ABNORMAL TOWING AT LOADS IN EXCESS OF FUSE VALUES SPECIAL TOW CABLES SHOULD BE RIGGED.

M1-0600-09-035

R R Ground Towing Load Limitations
Figure 206

C (2) Apply external power to the aircraft.

C (3) Pressurize B hydraulic system to charge the brake
C accumulator. Pressure should be about 3000 psi.

C (4) With brakes released turn OFF B pump.

CR E. Alternate Towing Procedure (No Electrical Power
CR Available)(FOR MCI USE ONLY).

CR NOTE: This procedure to be used while towing aircraft from
CR hanger to ramp or from ramp to hanger, and is to be
CR used for emergency stopping only.

CR (1) Use this alternate towing procedure when no external
CR power is available. The following steps must be
CR followed in order to assure that there will be brake
CR pressure if needed.

CR (2) Depressurize B system brakes.

CR (3) Remove tube above B brake accumulator (Ref IPC
CR 32-43-00-1, item 815). Retain tube in area for later
CR reinstallation.

CR (4) Install adapter tube, TWA P/N 32-43-00-0178 (Ref Figure
CR 207).

CR (5) Service B system brake accumulator per placard.

CR NOTE: Following gear change, bleed brakes before
CR pressurizing system.

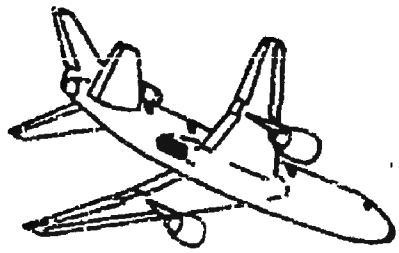
CR (6) Pressurize B system at fitting to 3000(±100) psi using
CR Sprague Engineering air operated portable hydraulic
CR unit, No. S-404.

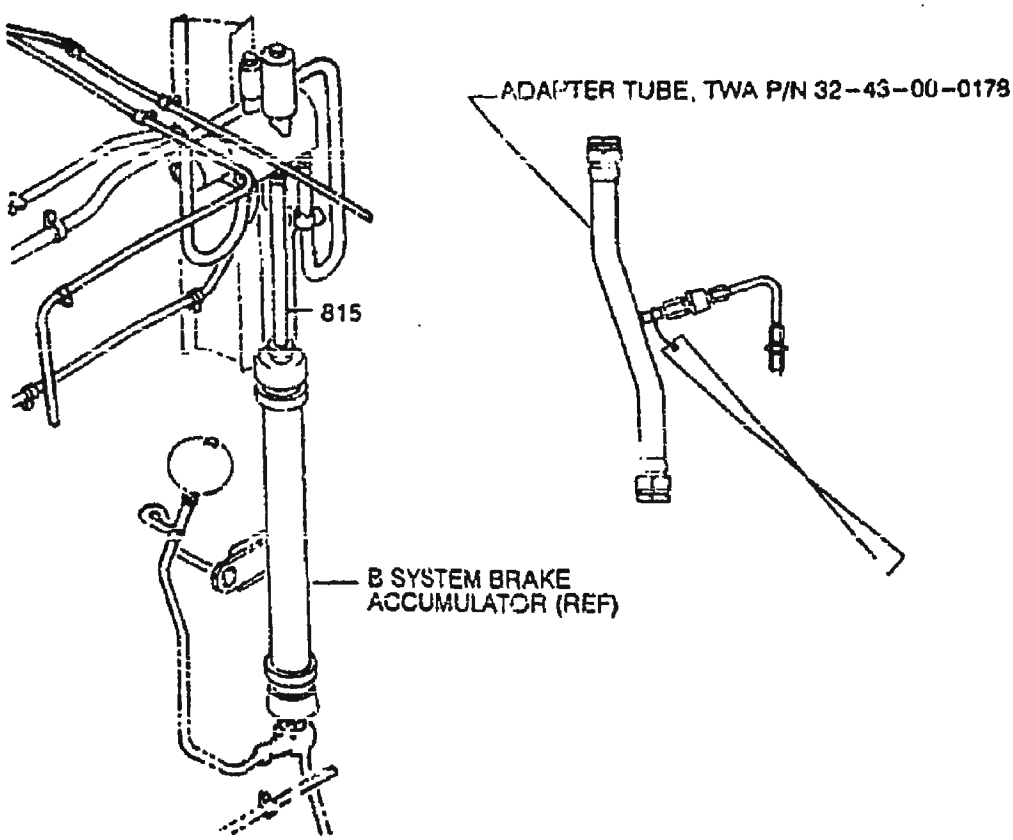
CR NOTE: Recheck B system brake accumulator if aircraft
CR is not towed within 30 minutes. Reservice if
CR pressure has dropped 200 psi or more.

CR (7) Remove pressure hose.

CR (8) When electrical power is again available, depressurize
CR B system brakes, remove adapter tube and reinstall
CR original tube.

CR (9) Pressurize B system and leak check tube fittings.





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CR
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Adapter Tube Installation
Figure 207

ABNORMAL TOWING CONDITIONS - MAINTENANCE PRACTICES

1. General

Abnormal towing conditions exist when:

The aircraft is off the runway in soft sand, earth, snow, mud, or is damaged.

Towing the aircraft from the nose gear would exceed the nose gear towing limit.

Any configuration of the aircraft that might produce longitudinal or lateral instability.

The main landing gear trucks are provided with towing lugs at the forward and aft end to which a towing cable can be attached (Ref. Fig. 201). The conditions for towing from the aft end of the truck are the same as towing from the forward end.

2. Towing

A. Preparation

(1) Ensure that nose gear torque arms are disconnected by removing torque arm apex pin and that upper torque arm is securely stowed in detent. Ensure that steering system control valve is in neutral, and that nosewheel steering lockout pin has been installed (Ref. Fig. 202 and 203).

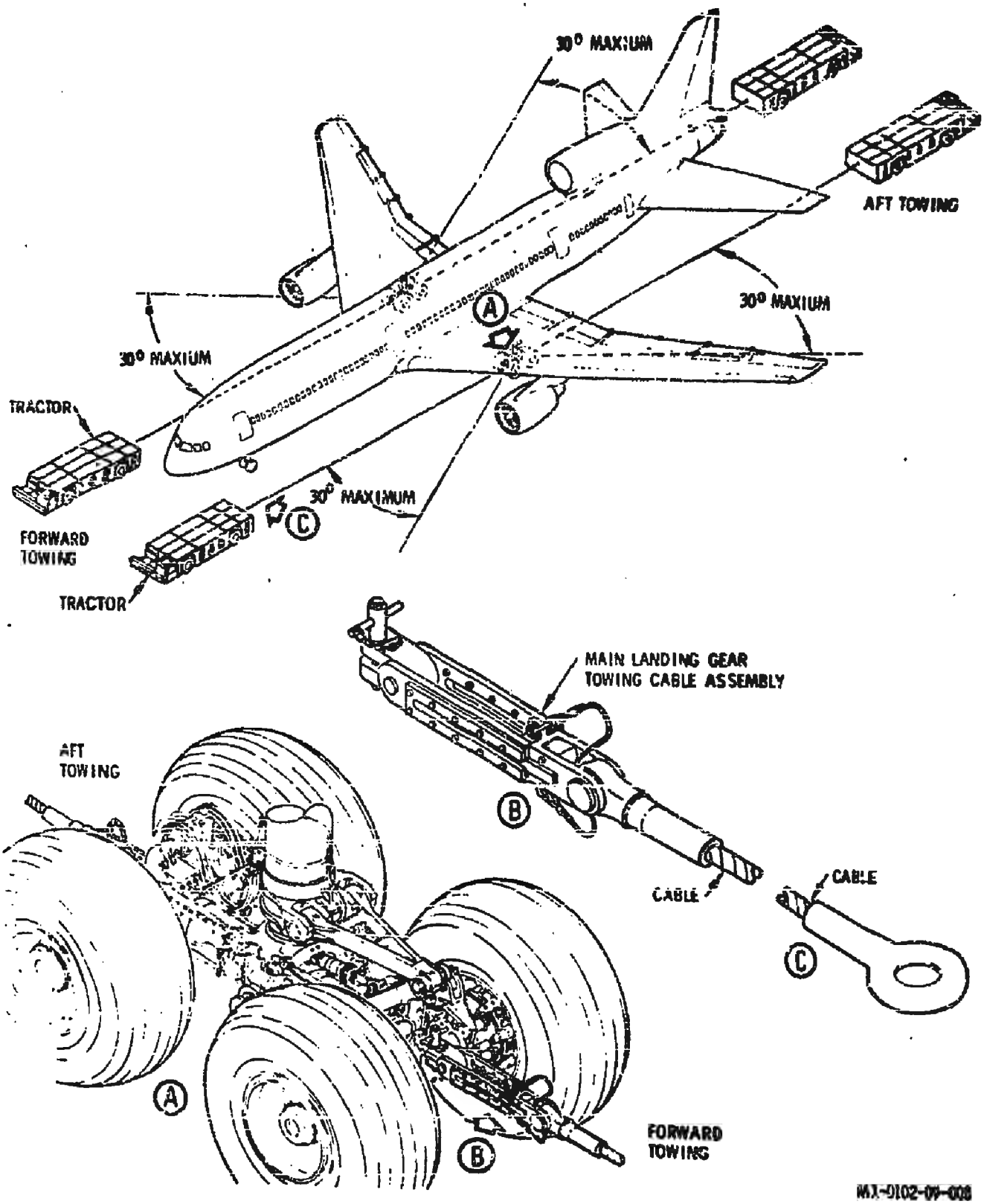
R CAUTION: VERIFY THAT LANDING GEAR CONTROL LEVER IS IN DOWN
R POSITION AND THAT MLG AND NLG DOWNLOCK SAFETY PINS ARE INSTALLED.

(2) Attach towing cables tc towing lugs.

NOTE: Cable release mechanism must have proper shear pins or shear plate installed.

R CAUTION: TO PREVENT STRUCTURAL DAMAGE TO AIRCRAFT, ENSURE THAT THE MAXIMUM TOWING LOAD TO EACH MLG TRUCK IS NOT EXCEEDED (REF. FIG. 204).

(3) Connect towing cable to the two tractors. Towing cables must be of sufficient length and proof-load strength to meet towing requirements.



R
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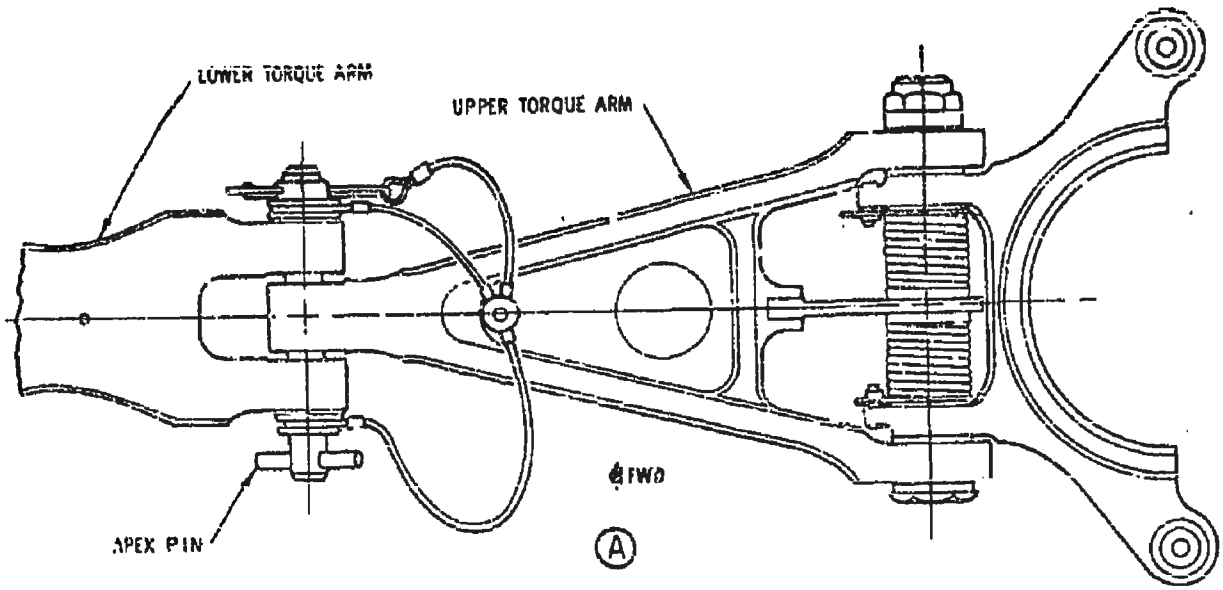
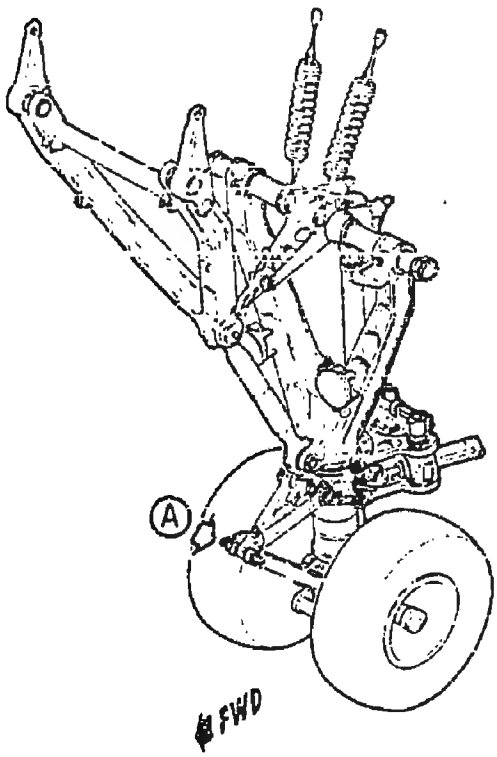
Main Landing Gear Towing
Figure 201

EFFECTIVITY: ALL

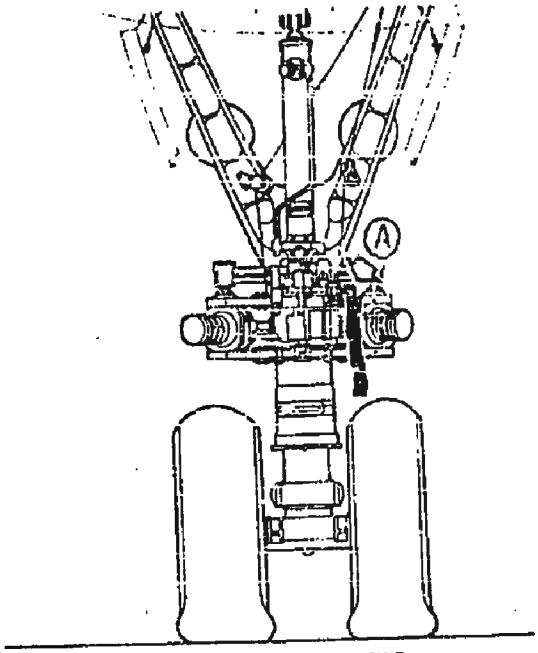
011B

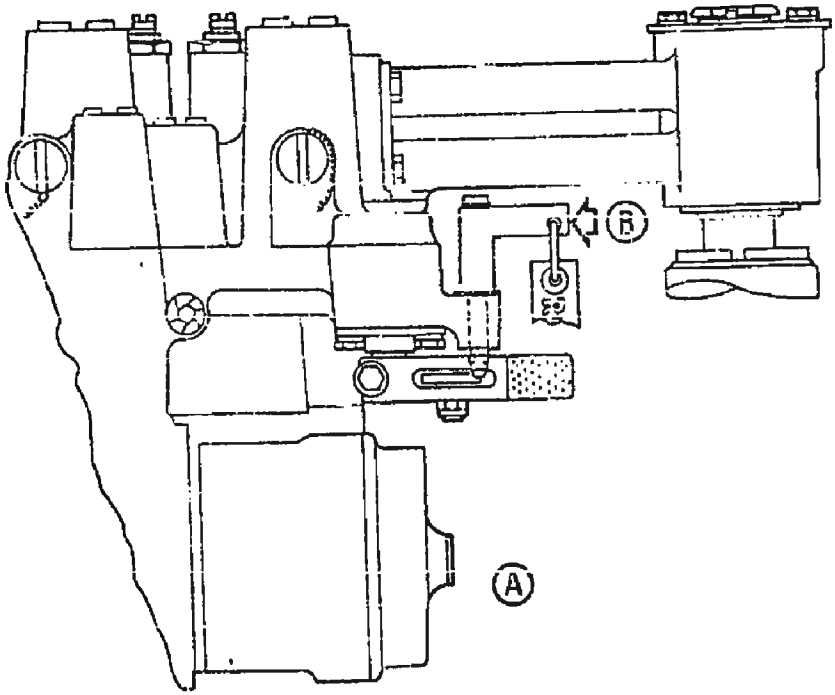


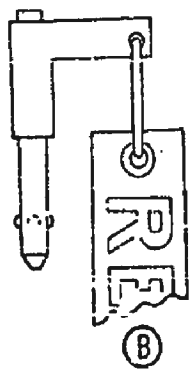


HH 5777
M1-A00-09-005

Torque Arm Apex Pin
Figure 202







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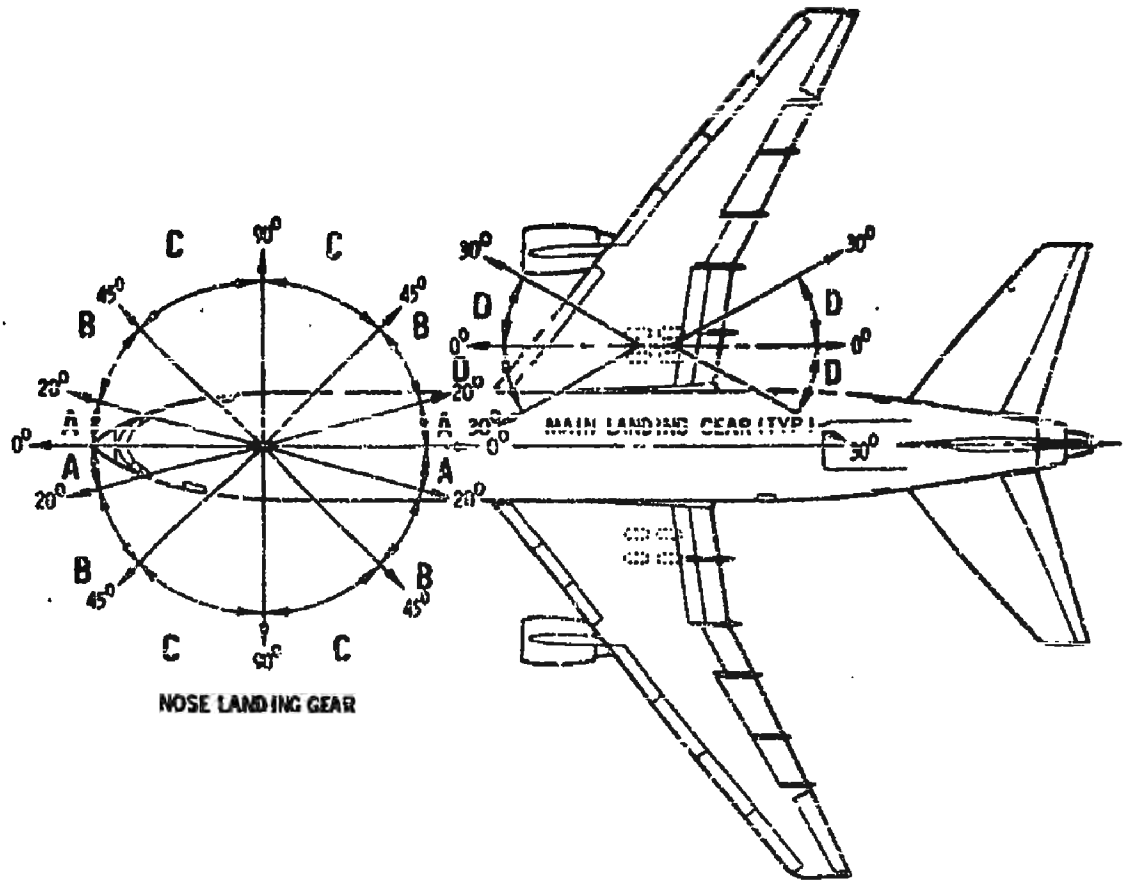
Nosewheel Steering Lockout Pin
Figure 203



MAXIMUM PERMITTED TOWING LOADS (NORMAL AND ABNORMAL TOWING)	TOWING DEVICE	MAXIMUM TOW LOAD PERMITTED BY LOAD LIMITING FUSE
A 70,200 LB (31,842 KG) (RANGE OF 0° TO 20° FROM ℄)	TOWBAR	55,485 ±2,500 LBS.
B 35,100 LB (15,921 KG) (RANGE OF 20° TO 45° FROM ℄)	↓	↓ ↓
C 35,100 LB (15,921 KG) AT 45° FROM ℄ VARYING TO 24,616 LB (11,256 KG) AT 90° FROM ℄ (LINEAR VARIATION AS SHOWN)	↓	↓ ↓
D 52,650 LB (23,882 KG) (RANGE OF 0° TO 30° FROM ℄)	TOW CABLE	35,000 LBS. FOR B751-101 CABLE 44,500 LBS. FOR B751-103 CABLE

NOTE

1 MAXIMUM PERMITTED TOWING LOADS SHOWN ARE DESIGN LIMIT VALUES.

2 NLG TOWBAR LOADINGS IN ALL FOUR QUADRANTS ARE SYMMETRICAL AND CAN BE EITHER PUSH OR PULL. PULL LOADINGS ARE RECOMMENDED WHERE HIGHER RANGE OF LOAD IS REQUIRED FOR ABNORMAL TOWING.

3 MLG TOWING LOADS SHOULD BE APPLIED BY TOW CABLE.

4 FOR ABNORMAL TOWING AT LOADS IN EXCESS OF FUSE VALUES SPECIAL TOW CABLES SHOULD BE RIGGED.

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R R Ground Towing Load Limitations
Figure 204

EFFECTIVITY: ALL

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NOTE: Tractors must be operating on a surface that will ensure even towing forces. If towing surface is uneven or unstable, area under and in front of tractors must have supporting planks or matting.

(4) Keep area in front of tractors free from ice, snow, mud, or debris.

CAUTION: DO NOT EXCEED MAIN LANDING GEAR TOWING LOAD LIMIT. MAINTAIN SAME TOWING ANGLE (MAXIMUM OF 30 DEGREES FROM LANDING GEAR CENTERLINE) AT BOTH MAIN LANDING GEARS. DO NOT EXCEED LIMIT OF NOSEWHEEL STEERING IN TURNS. COORDINATE MOVEMENT OF TRACTORS TO PREVENT UNEVEN LOADS.

(5) Tow aircraft.

R B. Lateral Imbalance Towing Conditions and Limits

R (1) Typical aircraft configuration and fuel load R distribution combinations for which towing can be R accomplished without danger of exceeding lateral R balance limitations are shown in Figure 205.

R (2) Conditions other than those reflected in Figure 205, R should be evaluated by the cognizant engineering R department to determine proper procedures that will R assure compliance with lateral balance limitations.

R (3) Towing aircraft with external ballast on fuselage is R not recommended. Ballast for towing with both wing R engines removed and center engine installed is as R follows:

R (a) Before removing wing engines, determine total R aircraft weight and center-of-gravity.

R (b) Using weight and balance manual section 1-80-05, R and aircraft loading, determine aircraft R stability.

R (c) If required, add ballast in cargo containers, to R forward end of forward cargo compartment based on R Step 28(3)(b) calculations.

R (4) If safe procedures have not been followed, or following R a flight crew report that taxiing limits have been R exceeded, an inspection and check should be made in R accordance with Time Limits/Maintenance Checks (Ref. R 5-50-09).

FUEL DISTRIBUTION → / AIRCRAFT CONFIGURATION ↓	55,000 LB (24,940 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) FILLED, WITH REMAINDER IN OPPOSITE WING	105,400 LB (47,800 KG) 133,900 LB (60,775 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) EMPTY REMAINING TANKS FUEL.	155,000 LB (70,295 KG) OF FUEL. ASYMMETRICAL FUEL 4000 LB (1,814 KG) MAXIMUM	159,560 LB (72,363 KG) FUEL (FULL) NO ASYMMETRICAL FUEL
WING ENGINES AND CONTROL SURFACES INSTALLED	TOWING PERMITTED FOR AIRCRAFT WEIGHT 339,000 LB (153,740 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT 339,000 LB (153,740 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 427,000 LB (193,650 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 432,000 LB (195,918 KG) OR LESS
WING ENGINES INSTALLED, OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 330,000 LB (149,660 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 330,000 LB (149,660 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 419,000 LB (190,023 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 432,000 LB (195,918 KG) OR LESS
ONE WING ENGINE OFF, ALL WING CONTROL SURFACES ON.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 242,000 LB TO 293,000 LB	TOWING NOT PERMITTED	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 378,000 LB OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 406,000 LB (184,127 KG) OR LESS
ONE ENGINE OFF, OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 254,000 LB (115,193 KG) TO 284,000 LB (128,798 KG)	TOWING NOT PERMITTED	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 371,000 LB (168,254 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 377,000 LB (180,045 KG) OR LESS

NOTE

1. TO DETERMINE AIRCRAFT WEIGHT WITH APPLICABLE COMPONENTS REMOVED, THE FOLLOWING WEIGHTS ARE PRESENTED:

SLATS, NO. 5, 6, 7,	609 LB (275 KG) TOTAL (APPROX)
SPOILERS, NO. 3, 4, 5, 6,	121 LB (55 KG) TOTAL (APPROX)
OUTBOARD FLAPS, NO. 1, 2,	654 LB (295 KG) TOTAL (APPROX)
OUTBOARD AILERON	156 LB (71 KG) (APPROX)
WING ENGINE	13,500 LB (6120 KG) (APPROX)

2. ASYMMETRICAL FUEL IS DIFFERENCE IN LEFT WING FUEL AND RIGHT WING FUEL.

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Lateral Imbalance Towing Condition and Limits
Figure 205

FUEL DISTRIBUTION / AIRCRAFT CONFIGURATION	55,000 LB (24,948 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) FILLED, WITH REMAINDER IN OPPOSITE WING	105,270 LB (47,750 KG) 133,990 LB (60,595 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) EMPTY, REMAINING TANKS FULL	155,000 LB (70,306 KG) OF FUEL. ASYMMETRICAL FUEL 4000 LB (1,814 KG) MAXIMUM	190,240 LB (72,230 KG) FUEL (FULL) NO ASYMMETRICAL FUEL
WING ENGINES AND CONTROL SURFACES INSTALLED	TOWING PERMITTED FOR AIRCRAFT WEIGHT 389,000 LB (176,447 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT 368,000 LB (166,922 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 468,000 LB (212,281 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 468,000 LB (212,281 KG) OR LESS
WING ENGINES INSTALLED. OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 390,000 LB (172,365 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 358,000 LB (162,386 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 465,000 LB (210,920 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 468,000 LB (212,281 KG) OR LESS
ONE WING ENGINE OFF, ALL WING CONTROL SURFACES ON.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 217,000 LB TO 336,000 LB	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 244,000 LB TO 314,000 LB	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 421,000 LB OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 439,000 LB (199,127 KG) OR LESS
ONE ENGINE OFF. OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 229,000 LB (103,873 KG) TO 326,000 LB (147,871 KG)	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 259,000 LB (117,450 KG) TO 305,000 LB (138,346 KG)	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 412,000 LB (186,880 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 430,000 LB (195,095 KG) OR LESS

NOTE

1. TO DETERMINE AIRCRAFT WEIGHT WITH APPLICABLE COMPONENTS REMOVED, THE FOLLOWING WEIGHTS ARE PRESENTED:

SLATS, NO. 5, 6, 7,	609 LB (276 KG) TOTAL (APPROX)
SPOILERS, NO. 3, 4, 5, 6,	121 LB (55 KG) TOTAL (APPROX)
OUTBOARD FLAPS, NO. 1, 2,	654 LB (297 KG) TOTAL (APPROX)
OUTBOARD AILERON	156 LB (71 KG) (APPROX)
WING ENGINE	14,200 LB (6441 KG) (APPROX)

2. ASYMMETRICAL FUEL IS DIFFERENCE IN LEFT WING FUEL AND RIGHT WING FUEL.

M1-0000-00-GR7

R Lateral Imbalance Towing Conditions and Limits
R Figure 205

FUEL DISTRIBUTION → / AIRCRAFT CONFIGURATION ↓	55,000 LB (24,984 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) FILLED, WITH REMAINDER IN OPPOSITE WING	105,270 LB (47,790 KG) 133,590 LB (60,595 KG) OF FUEL. ANY SINGLE TANK (1, 3, 2L, 2R) EMPTY REMAINING TANKS FULL.	155,000 LB (70,306 KG) OF FUEL. ASYMMETRICAL FUEL 4000 LB (1,814 KG) MAXIMUM	159,240 LB (72,220 KG) FUEL (FULL) NO ASYMMETRICAL FUEL
WING ENGINES AND CONTROL SURFACES INSTALLED	TOWING PERMITTED FOR AIRCRAFT WEIGHT 389,000 LB (176,447 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT 368,000 LB (166,922 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 468,000 LB (212,281 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 466,000 LB (212,281 KG) OR LESS
WING ENGINES INSTALLED, OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 380,000 LB (172,365 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 356,000 LB (162,386 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 465,000 LB (210,920 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 468,000 LB (212,281 KG) OR LESS
ONE WING ENGINE OFF, ALL WING CONTROL SURFACES ON.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 213,000 LB TO 335,000 LB	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 242,000 LB TO 317,000 LB	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 424,000 LB OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 442,000 LB (200,488 KG) OR LESS
ONE ENGINE OFF, OUTBOARD CONTROL SURFACES OFF ON LIGHT WING.	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 225,000 LB (102,058 KG) TO 329,000 LB (149,232 KG)	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 255,000 LB (115,666 KG) TO 308,000 LB (139,706 KG)	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 415,000 LB (188,241 KG) OR LESS	TOWING PERMITTED FOR AIRCRAFT WEIGHT OF 433,000 LB (196,405 KG) OR LESS

NOTE

1. TO DETERMINE AIRCRAFT WEIGHT WITH APPLICABLE COMPONENTS REMOVED, THE FOLLOWING WEIGHTS ARE PRESENTED:

SLATS, NO. 5, 6, 7,	609 LB (276 KG) TOTAL (APPROX)
SPOILERS, NO. 3, 4, 5, 6,	121 LB (55 KG) TOTAL (APPROX)
OUTBOARD FLAPS, NO. 1, 2,	658 LB (297 KG) TOTAL (APPROX)
OUTBOARD AILERON	156 LB (71 KG) (APPROX)
WING ENGINE	13,430 LB (6092 KG) (APPROX)

2. ASYMMETRICAL FUEL IS DIFFERENCE IN LEFT WING FUEL AND RIGHT WING FUEL.

M1-1070-09-022

R R Lateral Imbalance Conditions and Limits
Figure 205

TAXIING - DESCRIPTION AND OPERATION

1. General

Taxiing procedures for this aircraft are basically the same as those used for aircraft equipped with a convantional tricycle landing gear.

Nosewheel steering control, rudder pedal steering, and engine thrust, as required, are used to maneuver the aircraft.

TAXIING - MAINTENANCE PRACTICES

1. Equipment and Materials

Landing Gear Downlock Safety Pins Dwg No. 1302300, or equivalent

Main Landing Gear Chocks, Brooks & Perkins Ind., or equivalent

2. Referenced Procedures

24-41-00 External Power/Ground Service System - Maintenance Practices

80-11-00 Engine Starting

3. Maintenance Practices

A. Prepare for Taxiing

CAUTION: DO NOT TAXI AIRPLANE IF ACCESS PANELS 471EL or 471DR ARE NOT INSTALLED.

(1) Before taxiing aircraft, check that:

(a) Main landing gear and cargo doors are closed.

CR (b) Deleted.

(c) Nosewheel steering control valve is in neutral position and nosewheel steering lockout pin is removed.

(d) Nosewheel is aligned with aircraft centerline.

(e) Static ground cables are removed.

(f) All ramps, ladders, workstands, and other servicing equipment are removed.

(g) Main landing gear wheels are chocked.

B. Taxiing Procedure

(1) Station two qualified men in flight station: one to taxi aircraft and one to assist and act as an observer.

(2) Place BRAKE SYS SELECT switch on the pilots center instrument panel, zone 210, in the NORMAL SYSTEM B

position and the ANTI-SKID monitor OFF-ON switch on the pilots overhead panel, zone 210, in the OFF position.

R R WARNING: ENSURE AREAS IN FRONT OF AIRCRAFT AND JET EXHAUST WAKE ARE CLEAR OF EQUIPMENT AND PERSONNEL.

(3) Start engines (Ref. Fig. 201 and 80-11-00).

R (4) Remove external power source (Ref. 24-41-00) and chocks.

(5) Close nose steering circuit breaker (F19) on Flight Engineer/Second Officers overhead circuit breaker panel, (CB2).

R R R CAUTION: WHEN AFCS/MLG ACCESSORY UNIT IS DISCONNECTED ALL TAXIING MUST BE DONE WITH ANTI-SKID OFF TO PROVIDE BRAKING.

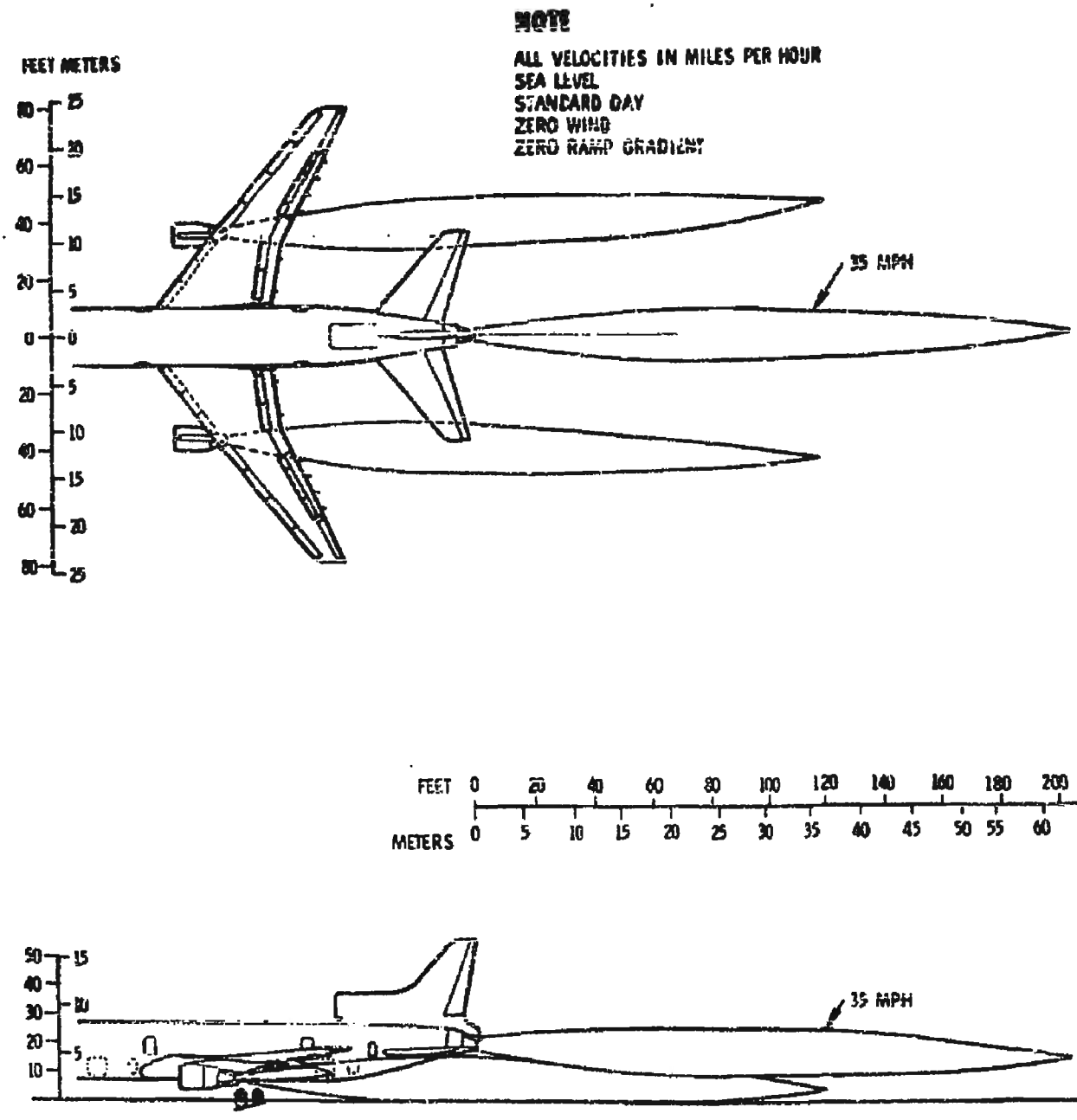
(6) Taxi aircraft using minimum breakaway thrust and largest turning radius practicable. Do not start turn until aircraft is moving (Ref. Fig. 202 and 203).

(7) Maneuver aircraft using Captains nose gear steering wheel. Steering wheel will produce a steering angle of 64 (±2) degrees either side of center. Rudder pedal steering will produce a steering angle of 6 degrees either side of center.

(8) Taxi aircraft to desired area using wing walkers in congested areas and control tower instructions, as applicable. Do not stop aircraft in a turn. Center nosewheel steering control and allow aircraft to roll forward to align nose and landing main gear wheels.

R R (9) Shut down engines upon completion of taxing (Ref. 80-11-00).

(10) Chock main landing gear wheels and connect static ground cables.

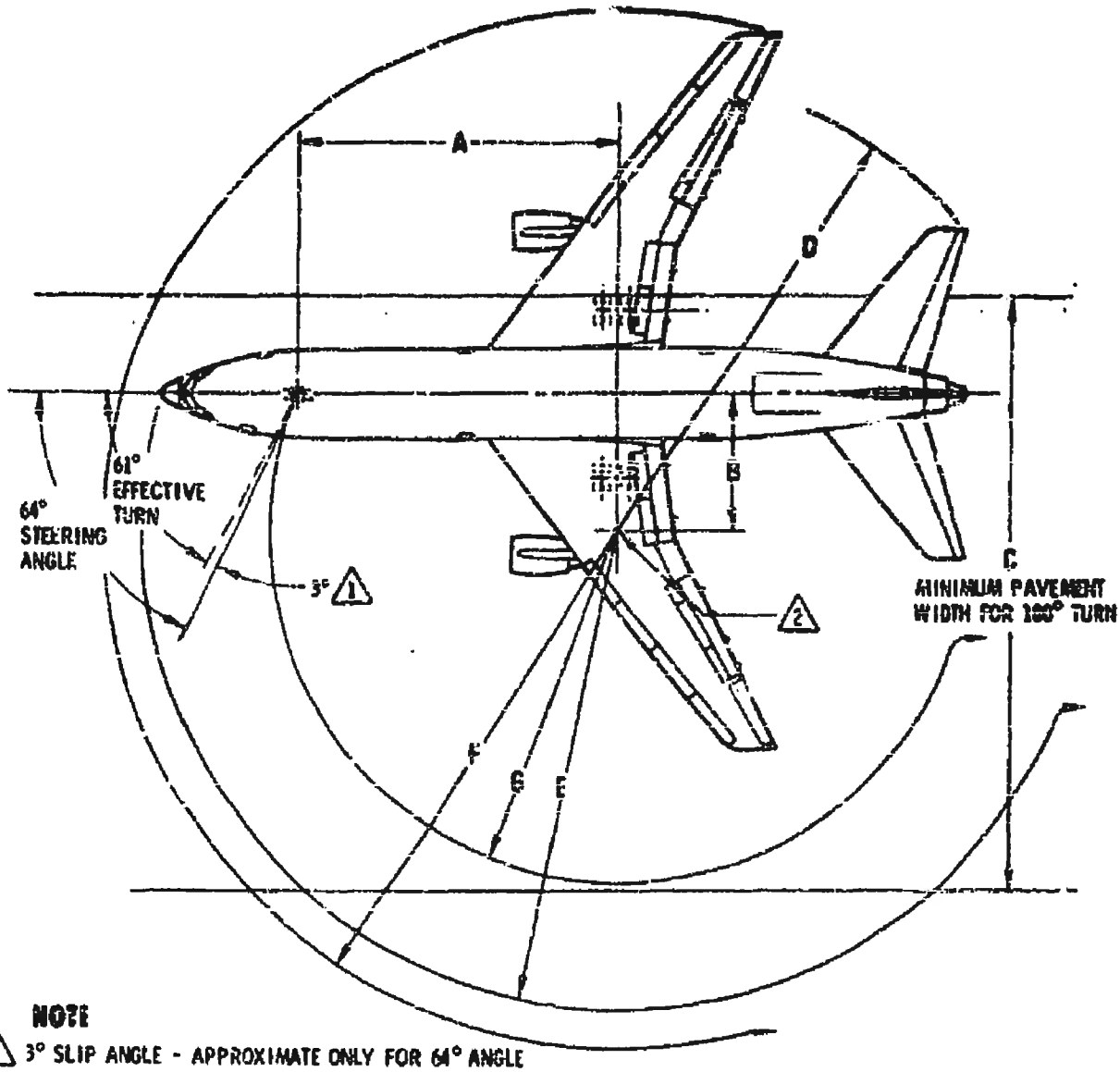

NOTE
ALL VELOCITIES IN MILES PER HOUR
SEA LEVEL
STANDARD DAY
ZERO WIND
ZERO RAMP GRADIENT
FEET METERS
35 MPH
FEET 0 20 40 60 80 100 120 140 160 180 200
METERS 0 5 10 15 20 25 30 35 40 45 50 55 60
35 MPH

MI-0103-00-020

R Engine Exhaust Velocity Contours - Ground Idle Power
R Figure 201

EFFECTIVITY: ALL

001B



NOTE

1. 3° SLIP ANGLE - APPROXIMATE ONLY FOR 64° ANGLE
2. THEORETICAL CENTER OF TURN FOR MINIMUM TURNING RADIUS. TURN INITIATED WITH AIRPLANE IN MOTION. APPROXIMATELY IDLE THRUST ON ALL ENGINES. NO DIFFERENTIAL BRAKING

FT-IN / M	A	B	C	D	E	F	G
L-1011-1 L-1011-100 L-1011-200	70-0 / 21.34	38-10 / 11.84	141-3 / 43.05	106-9 / 32.46	107-0 / 32.61	121-3 / 36.96	80-2 / 24.74

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R
R

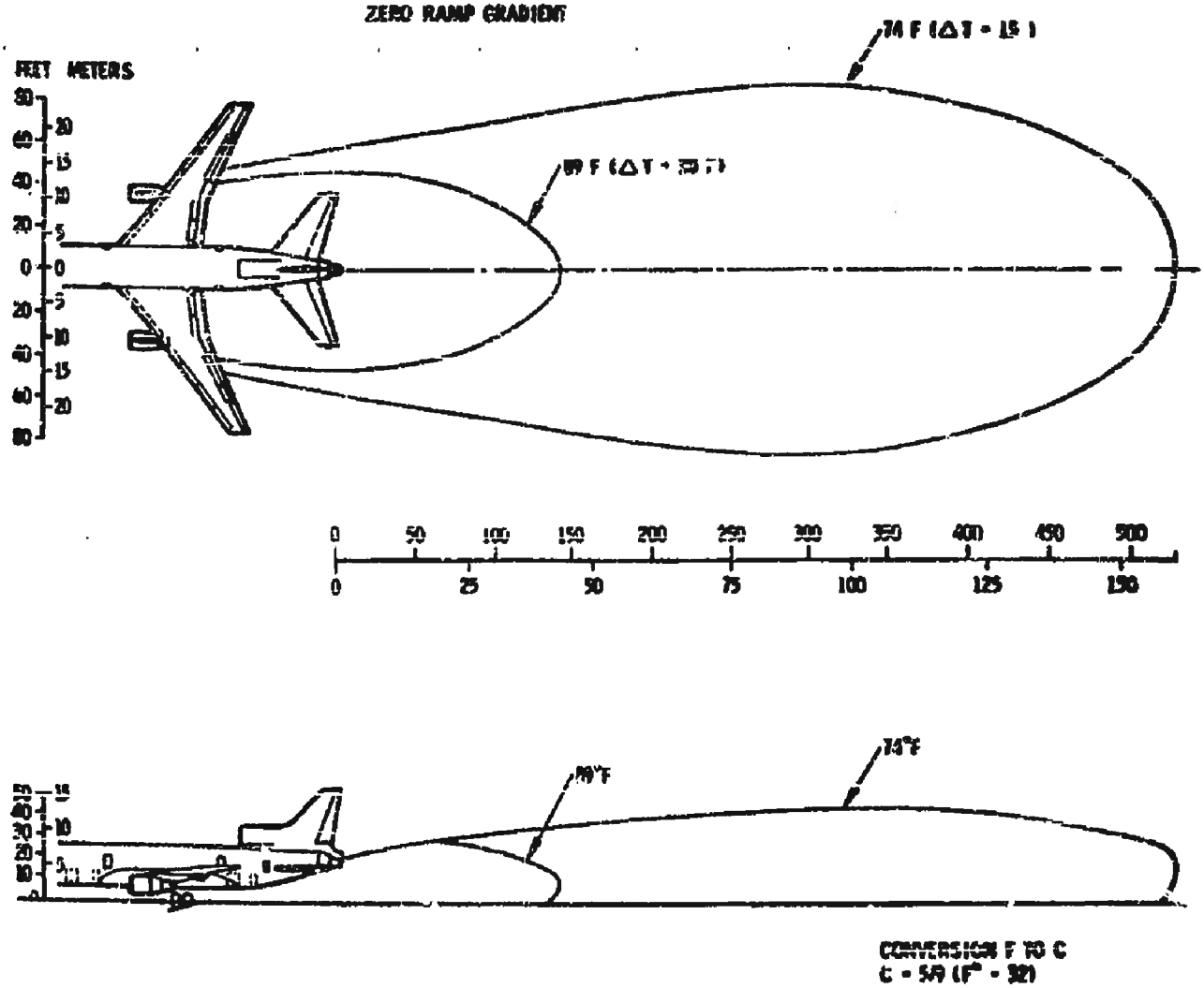
Minimum Turning Radii
Figure 202

EFFECTIVITY: ALL

001B

NOTE

ALL TEMPERATURES IN DEGREES FAHRENHEIT
SEA LEVEL
STANDARD DAY
ZERO WIND
ZERO RAMP GRADIENT



CONVERSION F TO C
C = 5/9 (F° - 32)

Engine Exhaust Temperature Contours - Breakaway Taxi Power
Figure 203

EFFECTIVITY: ALL